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THE ESTROUS CYCLE OF THE COTTON-RAT, *SIGMODON HISPIDUS*

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IN the present investigation, the estrous cycle of the cotton-rat (*Sigmodon hispidus cienegae* A. B. Howell) was studied by means of the vaginal smear method. Benson (in press) in a study of the life history of the cotton-rat, used daily vaginal smears for the purpose of procuring timed matings and obtained some data relative to total length of the estrous cycle, but did not work out the lengths of the various stages of the cycle.

The cotton-rats used in this study were 20 female progeny from a stock of *Sigmodon* obtained from the Cranbrook Institute of Science, Bloomfield Hills, Michigan. The original stock was collected by V. H. Cahalane near Rodeo, Hidalgo County, New Mexico. Of the females used 10 were virgin, and 10 had each produced 1 or more litters of young.

Vaginal smears were taken with a platinum loop 3 times daily (9 A. M., 3 P. M., 9 P. M.) for 16 days. It was found that the type of smear could easily be determined without staining the slides.

Proestrum in the cotton-rat was found to last from 12 to 21 hours, the average duration being 14.5 hours. This period is initiated by a marked reduction in number of leucocytes accompanied by a great increase in number of epithelial cells and continues until the smear consists entirely of nucleated epithelial cells.

Estrum, or the cornified cell stage, in the cotton-rat varies greatly in length (21 to 123 hours), but averages 46.6 hours in duration. The smear consists of great numbers and often masses of cornified cells during most of the stage.

Metestrum in this species is distinguished by a vaginal smear consisting entirely of nucleated epithelial cells. Finally leucocytes begin to appear, and the epithelial cells become reduced in numbers until the typical diestrous condition is reached. Metestrum varies in length from 9 to 21 hours, but, like proestrum, averages 14.5 hours in duration.

Diestrum is especially variable in length, lasting from 42 to 156 hours, the average time being 116 hours.

The entire estrous cycle averages 8 days in length, but it ranges in different individuals from 5 to 9 days.

No consistent difference was found between the estrous cycles of young nulliparous females and those of the older parous females.

One Fallopian tube of a female which exhibited a late metestrous smear when killed was sectioned and 4 ova were counted. In this animal, at least, ovulation probably took place in late estrum or early metestrum. The Fallopian tubes are greatly convoluted, as in the house-mouse and Norway rat. During proestrum and estrum the uterus is distended with fluid. In diestrum the epithelium of the uterine mucosa is flattened in appearance, but during estrum the epithelial cells are columnar in type.

DISCUSSION

The estrous cycle of the cotton-rat is very similar to that of the deer-mouse, *Peromyscus* (Clark, 1936), in that the vaginal smear in metestrum consists almost entirely of nucleated epithelial cells. A similar condition occurs in the guinea-pig (Selle, 1922), and is found occasionally in the Norway rat (Long and Evans, 1922), but is not mentioned by Allen (1922) in the house-mouse. In the Norway rat and house-mouse, the metestrous smear consists of cornified cells and leucocytes, and nucleated epithelial cells do not appear in the lumen of the vagina until later. It is possible that these differences have taxonomic significance.

The average length of estrum or the cornified cell stage in the cotton-rat, (46.6 hours) appears to be longer than that in the Norway rat and deer-mouse. According to Long and Evans (1922) this stage lasts approximately 27 hours in the Norway rat, and I find that it persists about the same length of time in the deer-mouse. Allen (1922) states that estrum in the house-mouse lasts most commonly 1 or 2 days. The diestrous period also appears to be longer in the cotton-rat than in the other forms. Except for the differences noted above, the estrous cycle of the cotton-rat is similar to that in the Norway rat, house-mouse, and deer-mouse.

LITERATURE CITED

ALLEN, E.
1922 The oestrous cycle in the mouse. Amer. Jour. Anat., 30: 297–372.
BENSON, SETH B.
In Press Notes on the breeding of the cotton rat, *Sigmodon hispidus*.
CLARK, F. H.
1936 The estrous cycle of the deer-mouse, *Peromyscus maniculatus*. Contrib. Lab. Vert. Gen., Univ. Mich., No. 1: 1–7, Pl. I.
LONG, J. A., and H. M. EVANS
1922 The oestrous cycle in the rat and its associated phenomena. Univ. Calif. Mem., 6: 1–148.
SELLE, R. M.
1922 Changes in the vaginal epithelium of the guinea-pig during the oestrous cycle. Amer. Jour. Anat., 30: 429–449.